# Answer Key: Civil Engineering Licensure Exam – Mock Exam (Day 32: Influence Lines and Moving Loads)

February 24, 2025

## Answer Key

### Section A: Multiple Choice Solutions

1. Influence lines determine: **(a) The internal forces in a structure due to moving loads**
2. A peak in an influence line indicates: **(a) The maximum effect of a moving load at that location**
3. Müller-Breslau Principle states: **(a) The influence line for a force is the deflected shape of the structure when the force is applied**
4. Influence line for a reaction in a simply supported beam: **(a) A straight line sloping from 0 to 1**
5. Maximum bending moment in a simply supported beam: **(a) The load is at the midpoint of the beam**

### Section B: Problem-Solving Solutions

1. Influence line for the reaction at A:

$$IL_A(x) = 1 - \frac{x}{L}$$

Where $L = 8$ m, the line starts from 1 at $x = 0$ and decreases to 0 at $x = 8$.

2. Influence line equation for shear force at 4 m:

$$IL_V(x) = \begin{cases} \frac{(L-a)}{L}, & x < a \\ -\frac{a}{L}, & x > a \end{cases}$$

For $L = 10$ m and $a = 4$ m, the influence values at 4 m are computed.

3. Maximum bending moment due to moving load:

$$M_{\max} = \frac{PL}{4}$$

$$= \frac{15 \times 12}{4} = 45 \text{ kN·m}$$

4. Maximum reaction due to moving UDL:

$$R_A = \frac{wL}{2} = \frac{5 \times 6}{2} = 15 \text{ kN}$$

5. Truck positioning for maximum bending moment: The maximum moment occurs when the larger axle load is closest to the inflection point of the influence line. Solving for the critical position yields the axle locations for maximum effect.